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(71) Applicant *(for all designated States except US)*: CELLULAR TECHNICAL SERVICES COMPANY [US/US]; 2401 Fourth Avenue, Suite 808, Seattle, WA 98121 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)* : AMADON, Charles, Gregory [US/US]; 518 N. 64th Street, Seattle, WA 98103 (US). ELLIOTT, Cameron, Scott [US/US]; 5003 15th Avenue N.E., #106, Seattle, WA 98105 (US).

(74) Agents: GRAYBEAL, John, O. et al.; Graybeal Jackson Richardson & Haley, 10655 N.E. 4th Street, Suite 705, Bellevue, WA 98004 (US).

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(54) Title: REAL TIME CELLULAR PHONE RENTAL SYSTEM AND METHOD
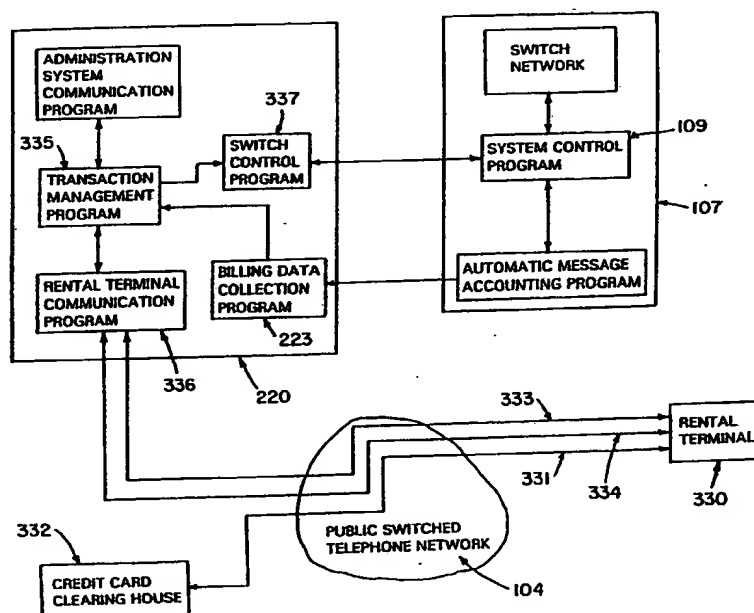
(57) Abstract

Cellular telephone rental system and method wherein a point-of-purchase rental terminal (330) capturing transaction data, obtains validation thereof, and communicates same to a collector (220) which in turn instructs a switching system (108) to enable the cellular phone (101) to make and receive calls. The collector (220) examines in real time automatic message accounting data (110) in the switching system (108) and calculates call charges in real time. The collector (220) then transmits call data to the rental terminal (330) which provides both rental agency and the cellular phone (101) user call data in real time, with the call data also being transmitted to an account administration system nightly (440).

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REAL TIME CELLULAR PHONE RENTAL SYSTEM AND METHOD

CROSS-REFERENCE TO RELATED APPLICATION

5   This application is a continuation of U.S. patent
application 07/527,136, entitled Real Time Cellular Phone
Rental System And Method, and filed May 22, 1990.

BACKGROUND OF THE INVENTION

10   Field of the Invention

Cellular telephone rental system under control of a
collector system controlling call placement, call detail and
providing real time data collection and billing.

Description of the Prior Art

15   The business of renting cellular phones has been
fraught with bad debt and cash flow problems. These problems
have been so severe that they have limited profit margins for
some cellular phone rental companies and forced others out of
business entirely even though the demand for such service has

20 remained high.

There are two primary reasons for the difficulties in
renting cellular telephones. Firstly, the cellular phone
rental companies must deal with a cash flow problem which is
beyond their control. Presently, cellular telephone service

25 carriers cannot provide call detail and toll billing to the
rental companies on a more frequent basis than once per
month. The data are generally provided on paper and
sometimes magnetic tape. Either way, the rental company must
manually sort and order the tendered data into rental

30 transactions in order to bill customers. At best, a rental
company receives revenue from customers one month after the
service was first provided. Secondly, the rental company has
no direct control over when a phone is operable and when it
is not. This means that a phone sitting in inventory, ready

35 to be rented, may be used fraudulently by a thief or anyone
else who may have access to the phone.

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Several systems have focused on solving the second
problem, control of a cellular phone's operability. Their
solution to the problem is that of integrating a credit card
reader and a processor into the cellular phone for validating
5 a prospective customer's credit worthiness.

Examples of such systems are described in Harris U.S.
Patent No. 4,777,646 and D'Avello U.S. Patent No. 4,831,647.
While these systems are effective in eliminating fraudulent
use, they are expensive and require a rental company to use
10 one vendor's special phones exclusively. In addition, they
offer little help in solving the major problem of cash flow.

Summary of the Invention

The present invention eliminates the problems normally
15 associated with the rental of cellular phones.

Specifically, it provides for the collection of
billing information directly from the cellular telephone
switch in real time so that charges may be billed directly to
an authorized credit card.
20   In addition it provides a mechanism for controlling a
standard cellular phone's ability to make calls on demand by
issuing appropriate commands to the systems cellular
telephone switch, thereby eliminating potential fraud.

These and other features and advantages of the
25 invention will be evident from the following description of
certain preferred embodiments of the invention.

Brief Description of the Drawings

FIG. 1 is a schematic diagram of a conventional
30 cellular telephone system.

FIG. 2 is a schematic diagram of a cellular phone
system according to the present invention, including a
collector system and interface to the cellular telephone
switch.
35   FIG. 3 is a schematic diagram of a cellular telephone
rental transaction process according to the invention.

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FIG. 4 is a schematic diagram of a system for administering a cellular phone rental operation according to the invention.

FIG. 5 is a schematic diagram showing wide area rental
5 system including a plurality of collector systems as diagrammed in FIG. 1 and a plurality of administration systems as diagrammed in FIG. 4.

Description of the Preferred Embodiments

10   The Federal Communications Commission (FCC), which controls and regulates the cellular communication industry, is responsible for granting licenses required to operate cellular phone systems. The FCC has divided the country into a number of geographical areas. To encourage competition FCC
15 regulations require that there be two cellular telephone carriers in each geographical area. The FCC has further specified that one carrier must be a wire line, or standard phone service provider, and the other must be a non-wireline provider.

20   Cellular carriers provide a cellular system for each geographical area licensed. The cellular system serves to interconnect a cellular telephone subscriber with other cellular subscribers or with standard telephones.

FIG. 1 schematically illustrates a typical
25 conventional cellular system installed and maintained by a cellular carrier. There are three major parts to such a cellular telephone system: Cellular Subscriber Stations 101; Cellular Base Stations (or cell sites) 102; and a Mobile Telephone Switching Office (MTSO) 103.

30   The Subscriber Stations 101 are standard portable or mobile telephones, each consisting of a standard transceiver, handset and antenna.

Cellular Base Stations 102 are arranged adjacent areas called cells. The base stations are responsible for setting
35 up and maintaining calls placed to and from subscriber stations in their respective cells, "handing off" calls to

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neighboring cell sites as subscribers move and communicating call progress with the MTSO 103 through network connection 106.

The MTSO consists of a telephone Switching System 107
5 with network connections to Cellular Base Stations 106 and trunk lines 105 to and from the Public Switched Telephone Network (PSTN) 104. Examples of known cellular telephone switches are the Autoplex 1000 from AT&T and the Motorola 2500. It is the function of the MTSO to maintain a database
10 of subscribers and subscriber features, track the progress of calls made to or from subscribers, and record call detail for billing purposes.

The telephone Switching System 107 is a computer which has three general programs: a switch network program 108,
15 system control program 109 and an automatic message accounting program 110.

The switch network management program 108 manages the interconnection of subscriber stations 101 and the PSTN 104.

The system control program 109 provides functions to
20 maintain the database of subscriber stations 101. Access to the maintenance functions is provided through asynchronous terminal connections 111 in a known manner.

The automatic message accounting program 110 delivers the call detail for billing purposes. The method of delivery
25 for the call detail varies from switch to switch. Some switches 103 only provide the data by storing it on magnetic tape drives 114. Others provide a synchronous connection 113 utilizing some layers of the CCITT X.25 protocol in addition to magnetic tape drives 114. Still others provide
30 asynchronous ASCII connections 112.

Real Time Monitoring and Control
The primary feature of this invention is that it enables the real time collection of data from the cellular
35 switch 107 and real time control of the database of subscriber stations 101. The real time operations are

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accomplished through the use of a multi-processor computer
system co-located at the cellular MTSO 103. This system can
be suitably referred to as the Collector System 220.

The Collector System 220 (sometimes herein referred to
5 simply as the Collector) is comprised of computer hardware
and communications devices under the control of specialized
programs. The Collector's programs function to process
rental transactions, collect and cost billing data, and to
activate/deactivate phones via direct switch control; all in
10 real time.

Real time control of subscriber stations is achieved
by connecting an asynchronous ASCII port controlled by the
Collector's switch control program 222 to an asynchronous
ASCII port provided on the cellular switch 107 and controlled
15 by the switch's system control program 109. With this
connection, the Collector 220 can query subscriber station
status and issue commands directly to the cellular switch
107.

Real time data collection is accomplished by
20 establishing a direct connection between the switch's
automatic message accounting program 110 and the Collector's
billing data collection program 223, utilizing interprogram
computed communication techniques in a manner known per se.
This connection is made to either an asynchronous ASCII port
25 112 or an X.25 connection 113 depending on what a particular
switch manufacturer may provide.

On switches where the manufacturer has no provision
for real time data collection, a direct interface to the
magnetic tape drives 114, where call data are logged is
30 required. In this case, real time data collection is
accomplished through the installation of passive tape taps
224 installed between the switch's automatic message
accounting program 110 and the switch's tape drives 114.

The Collector's billing data collection program is
35 responsible for receiving the switch Automated Message
Accounting (AMA) data from the switch, filtering out

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pertinent billable calls, calculating toll, and forming the
data into billable call records ordered by rental
transactions. The billable call records are stored and made
available for immediate recall on the Collector in a
5   non-volatile fashion, and for long duration (usually up to
one year).

Rental Transactions

Rental phones (stations 101) are standard portable or
10 mobile telephones. From the perspective of the cellular
switch, they are no different than any other subscriber
station. The Collector 220 maintains a list of all rental
phones currently in service, and when calls are placed to or
from any rental phone, the call detail is captured by the
15 billing data collection program 323 and stored in a database
by the transaction processing program 335.

Rental agents activate service to real time rental
phones using a small point-of-purchase device called a Credit
Card Terminal or Rental Terminal 330, such as known in the
20 industry as a VeriFone terminal, namely the Tranz 330
marketed by VeriFone, Inc. of Miliani, Hawaii. According to
the present invention, this terminal is programmed to make
two phone calls. The first call, shown schematically at 331,
is to a credit card clearing house 332 that checks the status
25 of the customer's credit card account. If the credit is
approved, the terminal 330 places a second call, shown
schematically as 333, to the Collector 220. The Collector
220 then processes the rental transaction and activates
service to the phone by a "check-out" procedure.

30 The "check-out" transaction from the rental terminal
330 is handled by a special communication program in the
Collector called the rental terminal communication program
336. This program captures the phone rental transaction data
(credit card number, phone number, date, time etc.) and
35 passes such to the transaction management program 335 where
it is stored in the transaction database. The transaction

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management program 335 then issues an "activate phone" order
to the switch control program 337 which in turn issues
appropriate commands to the system control program 109 on the
switch 107 to enable service to the rental phone. Rental
5 phones are not able to make or receive calls until they have
been activated on the switch 107 via the Collector 220.

    When a customer returns the rental phone, the rental
terminal 330 is used to close the transaction and deactivate
the phone on the switch 107 via the Collector 220. This is
10 accomplished again through a phone call from the rental
terminal 330, shown schematically at 333, to the Collector
220. The Collector 220 again processes the transaction and
disables service to the phone by a "check-in" procedure.

    The "check-in" transaction from the rental terminal
15 330 is handled by the Collector's rental terminal
communication program 336 using a protocol similar to the
"check-out" transaction. In the case of "check-in", however,
a "deactivate phone" order is issued to the switch.

    Upon completion of the check-in, the transaction
20 management program 335 sends a transaction receipt to the
terminal communication program 336 which in turn transmits it
to the rental terminal 330 where it is printed for the
customer's reference.

25   Rental Administration
    The Rental Administration System 440 consists of
standard computer hardware, including a computer, terminals,
printers and modems for communication with the Collector 220.
A known example of such a system is the MIServer marketed by
30 Pyramid Technologies.
    The Rental Administration System 440 receives
information from and transmits information to the Collector
220 over standard telephone lines connected to the PSTN 104.
A specialized program, the administration system
35 communication program 441, in the Collector 220 serves to
provide secure and reliable bi-directional communication with

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the Rental Administration System 440.   The administration
system communication program 441 utilizes the transaction
management program 335 on the collector to query for or make
modifications to transaction data on behalf of a given rental
5 administration system 440.

     With the information received from the Collector 220
the Rental Administration System 440 can bill customers
directly to their credit card accounts and provide
information about their rental phone usage.   The Rental
10 Administration System also tracks phone inventory, stores
customer information, and prints a variety of management
reports.

     Typically, the Rental Administration System 440 has
four major groups of programs: Phone Inventory Management,
15 Customer Serivce, Billing, and Management Reporting.

Phone Inventory Management includes:
          Add new phones to the rental phone inventory.
          Transfer phones to a different rental station.
20   Assign a new mobile number to a phone so it can be
          transferred to a rental station in another city.
          Assign a new car number to an installed phone so it can
          be transferred to a different vehicle.
          Record changes in a phone's status if a phone is out
25   for repairs or reported missing.
          Remove a phone from inventory.

Customer Service includes:
          Manual check-out or check-in of a phone when a problem
30   at a rental station prevents a rental terminal check-in
          or check-out.
          Review a rental transaction.
          Request, print and review a detailed list of calls for
          customers who request a call-by-call account of the
35   rental phone usage.
          Record comments about special or problem customers.

Billing includes:

Edit report prior to drafts printing or electronic
submission.

Printed sales drafts.

5   Electronic draft submission.

Draft register.

Credit drafts.

Management Reporting includes:

10   Rental station activity report.

Daily operations summary.

Agent point total report.

Real Time Phone Rental

15   The Real Time Phone Rental system can be readily
utilized as a wide area or even nationwide network consisting
of a multiplicity of Collector Systems 220 and Rental
Administration Systems 440.

One Collector System 503 (like Collector 220) is

20 required for each of the geographical areas 501, 502. This
means that a given collector system may be connected to
several switches 504, 505 since multiple switches are
required to handle the call traffic in more populated areas,
although in most carrier geographical areas a single

25 collector is connected to a single switch.

A Collector 503 can communicate with a multiplicity of
rental administration systems 506, 507. Therefore multiple
cellular rental vendors (e.g. car rental agencies) can
operate simultaneously in a given metropolitan area.

30   Conversely a given rental administration system 506 may
communicate with a multiplicity of Collector Systems 503,
509. This allows a cellular phone rental vendor to operate
in any city where a carrier has a collector system
operating.

35   From the foregoing various modifications and other
applications of the invention will be apparent to those

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skilled in the art to which the invention is addressed,
within the scope of protection afforded by the following
claims.

5

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WHAT IS CLAIMED IS:

   1.   The method of mobile telephone subscriber rental
call processing which utilizes a cellular telephone switching
system, a collector, an administration system and a
5 point-of-purchase rental terminal to track the rental
activity of a cellular telephone and bill charges directly to
a user's credit card account, comprising the steps of:
      capturing in the point-of-purchase rental terminal
phone rental transaction data including credit card number,
10 credit card expiration, rental phone number, and data and
time of the transaction;
      initiating a validation inquiry from the
point-of-purchase rental terminal to a credit card clearing
house as to the status of the user's credit card account and
15 receiving at the rental terminal the response from the credit
card clearing house;
      communicating the validation response to the
collector from the point-of-purchase rental terminal;
      issuing commands from the collector to the switching
20 system enabling the rental cellular telephone to make calls
at the inception of a rental transaction;
      examining in real time in the collector the call data
generated by the rental cellular phone by examining automatic
message accounting data in the cellular telephone switching
25 system;
      calculating in the collector the toll and air charges
for the captured call data;
      disabling the rental cellular phone's ability to make
calls upon termination of the rental transaction by the
30 collector issuing commands directly to the cellular telephone
switching system;
      storing in the collector the rental transaction charges
and associated detailed call records, from which the
collector transmits call data to the point-of-purchase rental
35 terminal upon termination of the rental transaction and the

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rental terminal generates for the user a written summary of
the rental transaction; and

      billing through the administration system the rental
transaction charges directly to the user's credit card
5 account.

      2. In a cellular telephone rental system including a
plurality of mobile telephone subscriber stations, each
associated with a point-of-purchase rental terminal, a
10 plurality of cellular phones, a cellular telephone switching
system including a plurality of trunk circuits to the public
switched telephone network, a collector, and an
administration system, the improvements by which the rental
activity of the mobile telephones is tracked in real time and
15 billed directly to a user's credit card account and a written
summary of the rental transaction is generated in real time
at the rental terminal, said system comprising:
      means in the point-of-purchase rental terminal for
capturing phone rental transaction data including the user's
20 credit card number, credit card expiration date, rental phone
number, and date and time of the transaction;
      means in the rental terminal initiating a validation
inquiry to a credit card clearing house and receiving the
response therefrom;
25   means in the rental terminal communicating the
validation response to the collector;
      means in the collector responsive to the validation
response issuing commands directly to the cellular telephone
switching system enabling the user's cellular phone to make
30 calls at the inception of a rental transaction;
      means in the collector capturing in real time the call
data generated by the cellular telephone by examining
automatic message accounting data in the cellular telephone
switching system;
35   means in the collector calculating the toll and air
charges for the captured call data;

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means in the collector responsive to a communication
from the point-of-purchase rental terminal for issuing a
command directly to the cellular telephone switching system
to disable the the user's cellular phone upon termination of
5 the rental transaction;

means in the collector storing the rental transaction
charges and associated detailed call records and transmitting
summary call data to the point-of-purchase rental terminal
upon termination of the rental transaction; and

10   means in the administration system by which the rental
transaction charges are billed directly to the user's credit
card account.

3.   A communications system according to claim 2,
15 comprising a plurality of said rental administration systems
in communication with said collector system.

4.   A communication system in accordance with claim 2,
wherein said rental administration system is in communication
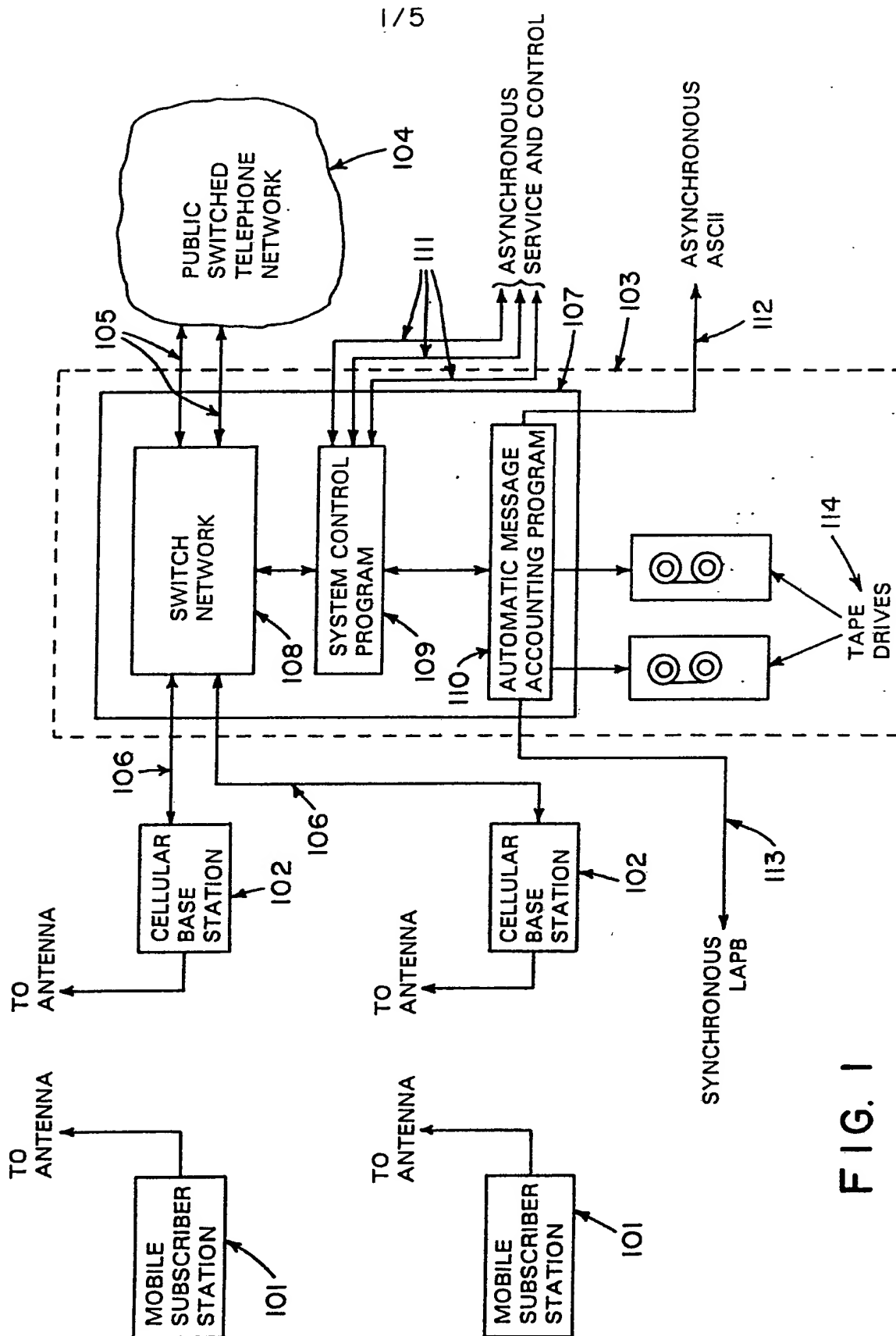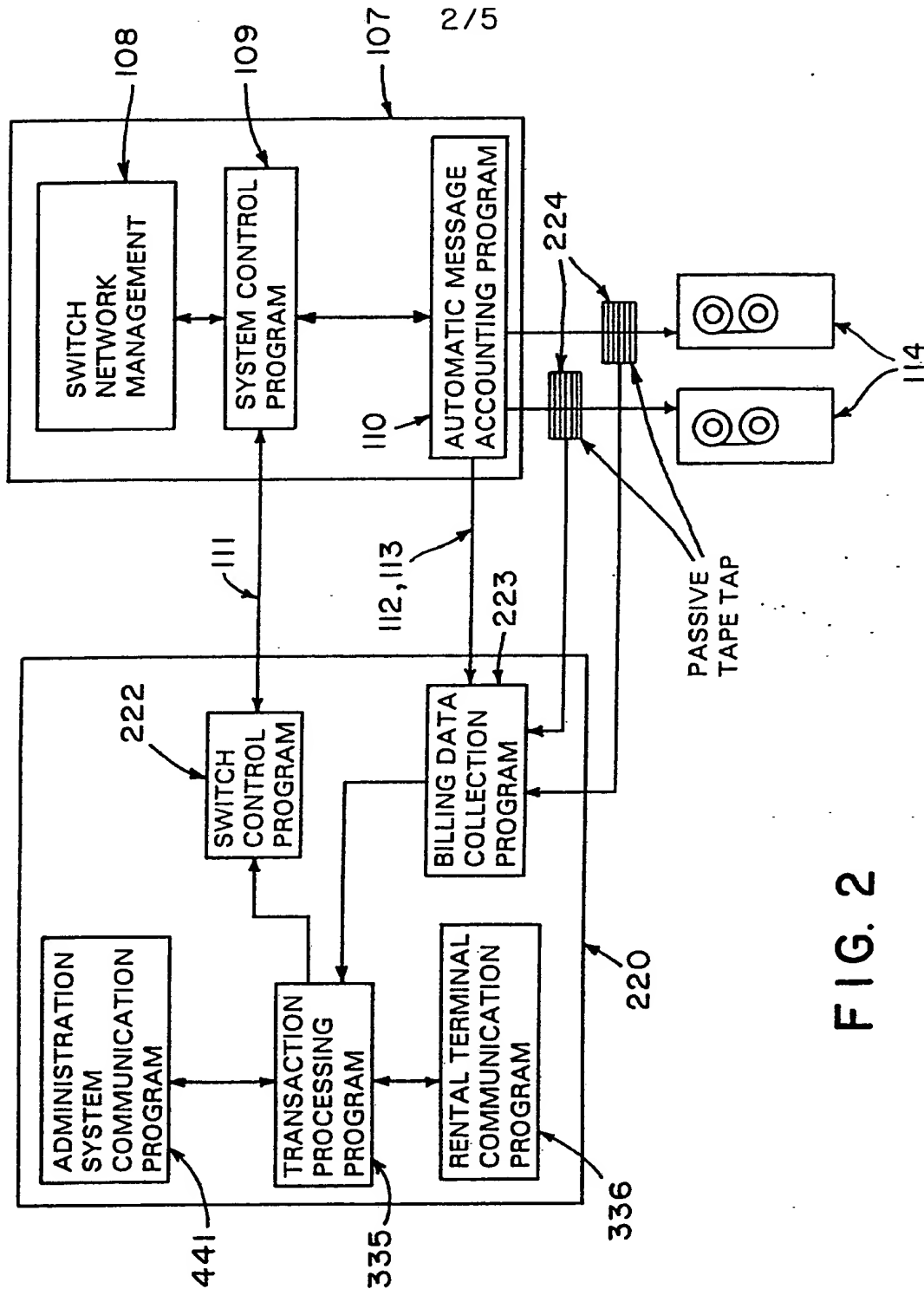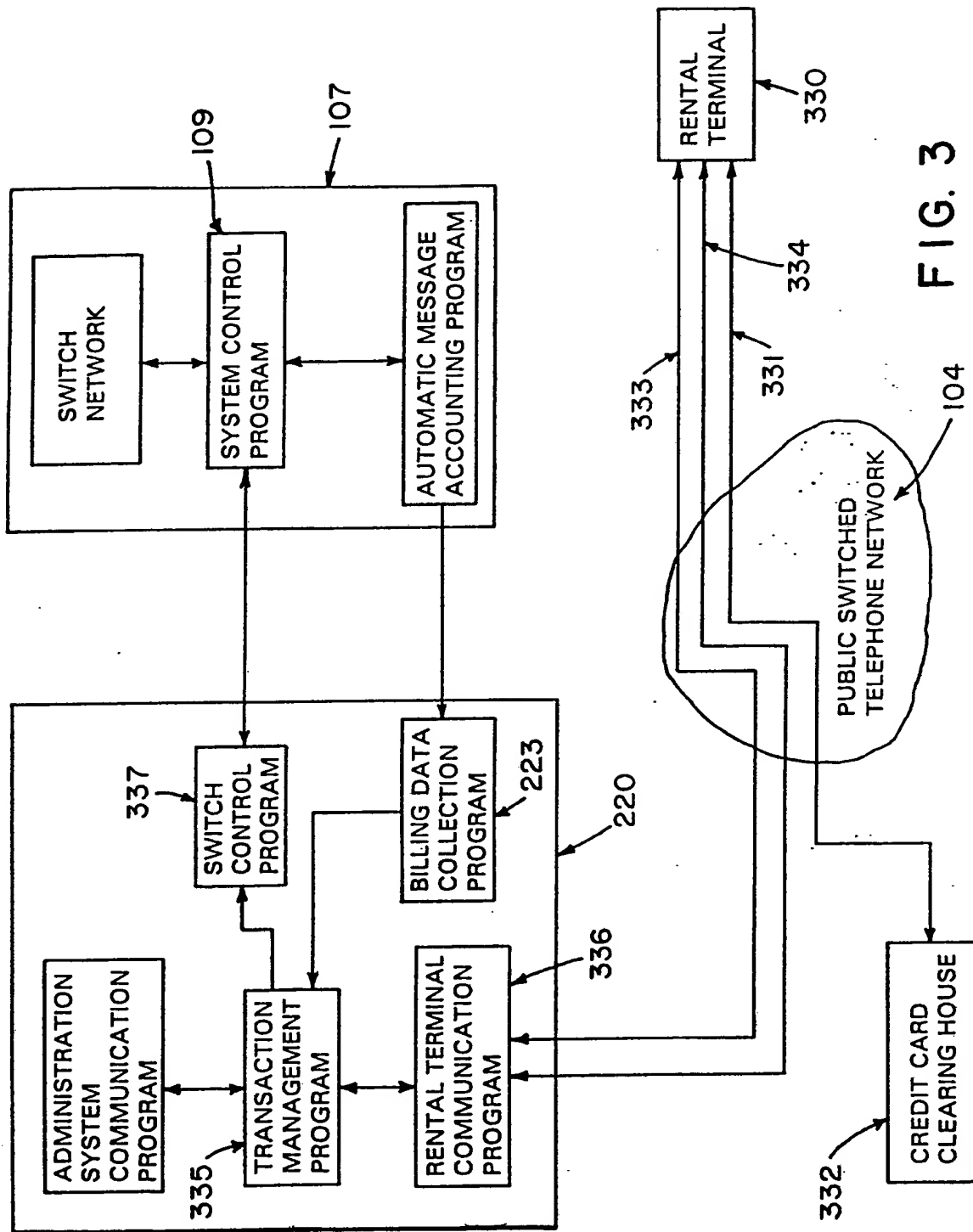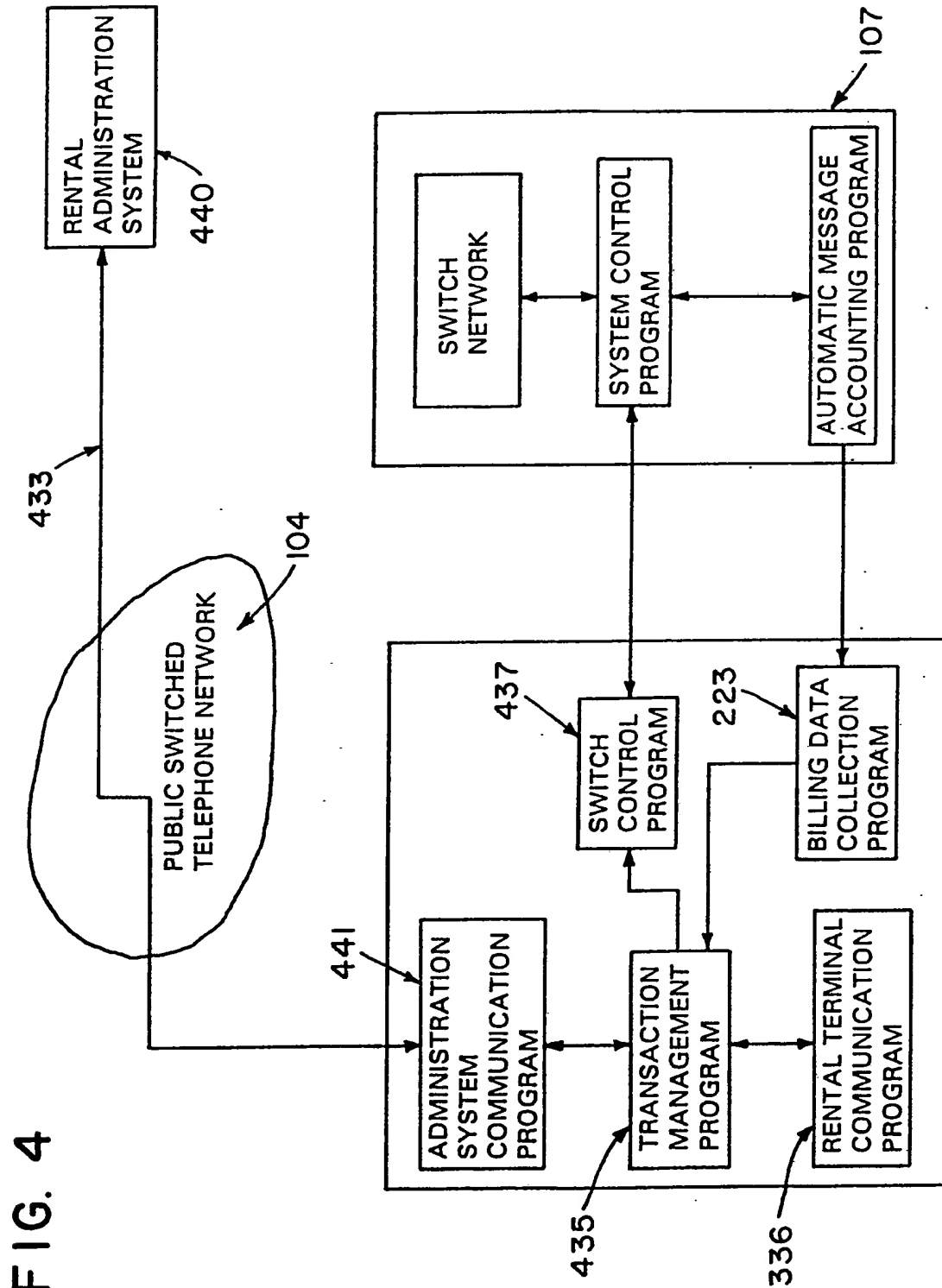20 with a plurality of collector systems.

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F I G. I

F I G. 2

FIG. 3

FIG. 4

RENTAL ADMINISTRATION SYSTEM — 440

433

PUBLIC SWITCHED TELEPHONE NETWORK — 104

SWITCH NETWORK

SYSTEM CONTROL PROGRAM

AUTOMATIC MESSAGE ACCOUNTING PROGRAM

107

437 — SWITCH CONTROL PROGRAM

223 — BILLING DATA COLLECTION PROGRAM

441 — ADMINISTRATION SYSTEM COMMUNICATION PROGRAM

435 — TRANSACTION MANAGEMENT PROGRAM

336 — RENTAL TERMINAL COMMUNICATION PROGRAM

5/5

FIG. 5

INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [1]
According to International Patent Classification (IPC) or to both National Classification and IPC

IPC (5): H04M 11/00
US Cl.: 379/59

.I FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
US	379/56,58,60,62,91,112,114,130,144

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category [*]	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
Y	US, A, 3,725,947 (Albertini et al) 03 April 1973 Figures 2 and 5	1-4
A	US, A, 4,640,986 (Votsutani et al) 03 February 1987	1-4
A	US, A, 4,776,000 (Parienti) 04 October 1988	1-4
Y	US, A, 4,776,003 (Harris) 04 October 1988 Figure 2; column 2, lines 55-65; column 3, lines 41-65; column 4, line 62 to column 5, line 54; column 6, lines 25-45	1-4
A	US, A, 4,831,647 (D'Avello et al) 16 May 1989	1-4
A,P	US, A, 4,951,308 (Bishop et al) 21 August 1990	1-4
A,P	US, A, 4,958,368 (Parker) 18 September 1990	1-4

* Special categories of cited documents: [13]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
11 July 1991	13 AUG 1991
International Searching Authority [1]	Signature of Authorized Officer [10]
ISA/US	William Cumming

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

Y,P	US, A, 4,975,942 (Zebryk) 04 December 1990 Column 1, line 57 to column 2, line 28; column 5, lines 32-66, column 4, lines 3-8	1-4

V ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [1]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons.

1. ☐ Claim numbers   because they relate to subject matter ' not required to be searched by this Authority, namely:

2. ☐ Claim numbers   . because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out ', specifically:

3. ☐ Claim numbers_____, because they are dependent claims not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [2]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers   .. -. table claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international s.   .   s c-.. those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search r-..   s re-.i "-. 3 .. the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Aut. _ . - . -. -.nite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (supplemental sheet (2) (Rev. 4-90)